

### What is claimed is:

[Claim 1] A method for the production of structural components out of long-fiber thermoplastic (LFT) with integrated continuous-fiber (CF) reinforcements in a single stage LFT – pressing manufacturing process, the method comprising the steps of:

- melting impregnated CF - tapes open in a heating station;
- subsequently transferring the CF-tapes into a two-part profile tool of a CF - profile forming station;
- within the CF-profile forming station, pressing the CF tapes for a short time period by means of a high heat transfer, yielding a shock-cooled, dimensionally stable thin casing layer, the CF tapes defining a CF-profile;
- after the pressing and shock cooling, separating the CF-profile from the profile tool;
- after the separating, transferring the CF-profile into an LFT - tool and positioning the CF-profile in a defined manner;
- after the positioning, introducing a molten LFT - mass into the LFT-tool;
- pressing the LFT-mass together with the CF – profile;

characterized in that during the pressing of the LFT-mass together with the CF-profile, the casing layer is melted open again at the surface and is thermoplastically melted together with the surrounding LFT - mass.

[Claim 2] The method of claim 1 wherein as the LFT – pressing manufacturing process, an LFT – extrusion process with a vertical LFT – press and a horizontal pressing tool is utilised.

[Claim 3] The method of claim 1 wherein as the LFT – pressing manufacturing process, an LFT – injection moulding process is utilised.

[Claim 4] The method of claim 3 wherein an LFT – injection moulding process with back pressing in the source flow is utilised.

- [Claim 5] The method of claim 1 wherein several CF – profiles are positioned in the LFT – tool and subsequently pressed together with the LFT – mass.
- [Claim 6] The method of claim 1 wherein CF – profiles are simultaneously produced in more than one CF – profile production line.
- [Claim 7] The method of claim 1 wherein in a profile tool, more than one CF – profile is produced.
- [Claim 8] The method of claim 1 wherein in a CF – profile forming station with more than one profile tool, a plurality of CF – profiles are pressed simultaneously.
- [Claim 9] The method of claim 1 wherein in the CF – profile forming station, a multi-stage profile forming process is carried out by means of a multi-part profile tool.
- [Claim 10] The method of claim 1 wherein the CF – tapes are pre-formed in plastic condition by pre-forming elements during the transfer into the profile tool.
- [Claim 11] The method of claim 1 wherein the shaping of the CF – profile comprises a three-dimensional profile shaping.
- [Claim 12] The method of claim 1 wherein the CF – profile in longitudinal direction comprises a bend, a twist, a fold, or a surface structuring and wherein the CF-profile has differing cross-sectional shapes.
- [Claim 13] The method of claim 1 wherein by means of the shaping of the tools, shapings on the CF – profiles and shapings of the LFT – mass are produced, for force introductions and for force transmissions between the CF – profiles and the LFT – mass as well as to inserts.
- [Claim 14] The method of claim 1 wherein what is formed is a CF – profile with a positioning shoulder, a thick tensile – and compressive force zone on top and underneath as well as a thinner thrust zone in between, which CF-profile is positioned in a rib or in a crimp of the structural component.

[Claim 15] The method of claim 1 wherein the shock-cooling period has a duration in the range of from 1 to 5 sec.

[Claim 16] The method of claim 1 wherein the LFT – mass comprises an average fiber length of at least 3 mm.

[Claim 17] The method of claim 1 wherein the thermoplastic material consists of partially crystalline polymers.

[Claim 18] The method of claim 1 wherein the thermoplastic material consists of partially crystalline polymers are polypropylene, polyethylene–therephthalate, polybutylene–therephthalate or polyamide and the continuous fiber reinforcement consists of glass–, carbon– or aramide fibers.

[Claim 19] The method of claim 1 wherein the CF – profiles comprise a surface layer of 0.1 to 0.2 mm of pure thermoplastic material without CF – fiber reinforcement.

[Claim 20] The method of claim 1 wherein the CF–profiles are built-up out of layers with differing fiber orientations.

[Claim 21] The method of claim 1 wherein additional, shaped, CF – profiles, which have been thermally inversely treated, with a non-deformable internal zone and a molten external zone are produced for dimensionally stable transfer into the LFT – tool.

[Claim 22] The method of claim 1 wherein the CF – profiles comprise locally differing strong shock-cooling zones between CF – profile and LFT – mass, the zones having thermoplastic bonding of correspondingly differing strengths.

[Claim 23] The method of claim 21 wherein the CF – profiles comprise locally differing shock-cooling zones.

[Claim 24] The method of claim 1 wherein a surface of the CF – profile adjacent to the LFT – tool has been strongly shock-cooled on one side and the opposite side has been more weakly shock-cooled.

[Claim 25] The method of claim 17, characterised in that phase transformation heat of the crystalline material (crystallisation heat, latent heat) is exploited during the shock-cooling in a hysteresis range  $DE_n$ .

[Claim 26] The method of claim 17, characterised in that surface of the CF – profiles following the shock-cooling are very rapidly brought back again to a temperature above  $DT_{kr}$  from a temperature below the crystallisation temperature range  $DT_{kr}$ .

[Claim 27] The method of claim 17, characterised in that during the shock-cooling with a slower passage through a crystallisation temperature range  $DT_{kr}$ , a corresponding crystalline proportion is generated in a lower layer.

[Claim 28] The method of claim 1, characterised in that the CF – profiles are positioned in shapings of the LFT – tool in differing fitting positions.

[Claim 29] The method of claim 1, characterised in that the CF – profiles in the LFT – tool are positioned on the lower tool or on the upper tool or both.

[Claim 30] An installation for the production of structural components out of long-fiber thermoplastic with integrated continuous fiber – reinforcements in a single stage LFT – pressing manufacturing process, the installation comprising:

- a heating station for the heating-up of impregnated CF – tapes;
- a CF - profile forming station for the shaping and shock-cooling with a profile press and a two-part thermally conditioned profile tool, into which the CF - tapes are transferred;

characterized in that the CF-tapes are pressed for a short time period and in doing so are shaped into a required CF - profile, so that by contact with the thermally conditioned profile tool at a profile surface, and further characterized in that with a high heat transfer, a shock-cooled, dimensionally stable thin casing layer is formed;

further characterized in that the CF – profile, following the defined shock-cooling period, is immediately completely separated from the profile tool and by means of a robot is transferred into an LFT - tool of an LFT - press and there is positioned in a defined manner;

further characterized in that thereupon a molten LFT - mass is introduced and together with the CF - profile is put under pressure, wherein the casing layer is melted open again on the surface and is thermoplastically melted together with the surrounding LFT - mass.

[Claim 31] The Installation of claim 30, characterised by a CF – profile forming station with profile tools, which in zones comprise locally differing thermal conditionings, namely heat transfers, specific heats and heat penetration coefficients or tool temperatures.

[Claim 32] The installation of claim 30, characterised by a CF – profile forming station with a transfer portal and handling elements for pre-forming and transferring of the CF – tapes.

[Claim 33] The installation of claim 30, characterised by an IR – heating station with a protection gas atmosphere, a chain conveyor, a transfer robot with grippers for transferring of the CF – profiles and molten LFT – mass, an LFT – extruder, an LFT – press and an installation control system with partial controls for the different stations.

[Claim 34] A structural component with at least one CF – profile in an LFT – mass, produced according to the method of claim 1 with shock-cooled CF – profiles.

[Claim 35] The structural component of claim 34, characterised in that the CF – profiles comprise a precisely defined shaping and a precisely defined position within the structural component.

[Claim 36] The structural component of claim 34 with partially crystalline thermoplastic material, characterised in that the CF – profiles in the zone of a lower layer below the profile surface comprise an enhanced crystallisation.

[Claim 37] The structural component of claim 34 with partially crystalline thermoplastic material, characterised in that on contact surfaces between CF – profiles and LFT – mass it comprises a directed crystallisation over the contact surface.